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10/008,646	11/09/2001	Christopher Loren Platt	SEAG 47948	7315

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EXAMINER

BERNATZ, KEVIN M

ART UNIT

PAPER NUMBER

1773

DATE MAILED: 03/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/008,646

Applicant(s)

PLATT, CHRISTOPHER LOREN

Examiner

Kevin M Bernatz

Art Unit

1773

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) 22-33 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-21 and 34-37 is/are rejected.
- 7) ☒ Claim(s) 19 is/are objected to.
- 8) ☒ Claim(s) 1-37 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Examiner's Comments

1. The examiner has interpreted applicant's composition claims as requiring greater than 0 atomic percent of the three elements Ir, Mn and N (i.e. claims 2 requires the following: $\text{Ir}_{2-78}\text{Mn}_{16-96}\text{N}_{>0}$). The examiner notes that applicant's claims are open to the presence of additional elements.
2. The limitation "the IrMnN layer is a seed layer for the ferromagnetic layer" has been interpreted only to require that the "seed layer" is deposited prior to the deposition of the ferromagnetic layer (i.e. the ferromagnetic layer is deposited after the IrMnN layer).

Election/Restrictions

3. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1 – 21 and 34 - 37, drawn to an IrMnN film product, classified in class 428, subclass 692.
 - II. Claims 22 - 33, drawn to method of making a IrMnN film product via sputtering in a reactive nitrogen-containing atmosphere, classified in class 427, subclass 250.

The inventions are distinct, each from the other because of the following reasons:

4. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the

Art Unit: 1773

process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process, such as by plating or ion doping.

5. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

6. During a telephone conversation with Mr. Alan Towner on March 4, 2003 a provisional election was made with traverse to prosecute the invention of Group I, claims 1 – 21 and 34 - 37. Affirmation of this election must be made by applicant in replying to this Office action. Claims 22 – 33 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Objections

7. Claim 19 is objected to because of the following informalities: claim 19 recites the limitation “IrMnN seed layer”, though the IrMnN layer is not referred to as a “seed layer” in base claim 9. For clarity, applicant is suggested to remove the word “seed” from claim 19 to more clearly define the antecedent basis. Appropriate correction is required.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. Patent App. Pub. 2002/0181170 A1) in view of Fuke et al. ('049).

Regarding claim 1, Lin et al. disclose a film comprising an IrMn alloy layer (i.e. IrMnNi) having a (200) texture (*Figure 13 – AFM layer; Paragraphs 0014; 0050; and 0061; and claim 2*).

Lin et al. fail to disclose an IrMnN film.

However, Fuke et al. teach that IrMnN films are known equivalents to the IrMn alloy films taught by Lin et al. (i.e. IrMnNi) (*Fuke et al. - col. 5, lines 33 – 39 and lines 46 – 55; Figures 3 – 9*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, IrMnNi and IrMnN are equivalents in the field of IrMn antiferromagnetic alloys. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Regarding claims 2 - 5, Fuke et al. disclose overlapping concentrations and that the exact alloy compositions are cause effective variables in terms of the blocking temperature and bias magnetic field (*col. 2, lines 57 – 67; col. 5, lines 54 – 55; and*

Art Unit: 1773

Figures 3 – 9). It would, therefore, have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the Ir, Mn and N concentrations through routine experimentation, especially given the Fuke et al. teachings. *In re Boesch*, 205 USPQ 215 (CCPA 1980), *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Regarding claim 6, Fuke et al. disclose thickness values meeting applicants' claimed limitations for controlling the exchange coupling forces of the antiferromagnetic IrMnN film in MR sensors (*col. 1, lines 6 – 11 and col. 7, lines 18 – 33*). It would, therefore, have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the film thickness through routine experimentation, especially given the Fuke et al. teachings.

Regarding claims 7 and 8, the limitation(s) “is an exchange biasing layer” and “is a seed layer” are (an) intended use limitation(s) and are not further limiting in so far as the structure of the product is concerned. “[I]n apparatus, article, and composition claims, intended use must result in a **structural difference** between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. **If the prior art structure is capable of performing the intended use, then it meets the claim.** In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art.” [emphasis added] *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963). See MPEP § 2111.02.

10. Claims 9 – 13, 15, 17 – 21 and 34 - 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. ('170 A1) in view of Fuke et al. ('049) as applied above, and further in view of Tanaka et al. (IEEE Trans. Mag., 35(2), 1999, 700 – 705).

Regarding claims 9, 10, 17, 21 and 34 - 36, Lin et al. in view of Fuke et al. disclose are relied upon as described above. Specifically, Lin et al. in view of Fuke et al. disclose a top-type spin valve sensor comprising a layered magnetic structure (*Figure 13*) comprising an IrMnN layer having a (200) texture (*AFM layer*); and a ferromagnetic layer (*Pinned layer*).

Neither Lin et al. nor Fuke et al. disclose the ferromagnetic layer (i.e. “pinned layer”) “deposited on the IrMnN layer” (i.e. above the antiferromagnetic layer).

However, Tanaka et al. teach that top-type spin valve sensors (substrate/free/non/pinned/antiferromagnetic) are known equivalent structures to bottom-type spin valve sensors (substrate/antiferromagnetic/pinned/non/free), which results in the ferromagnetic layer (i.e. “pinned layer”) being deposited on the IrMnN layer (i.e. “antiferromagnetic layer”) (*Abstract*). Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, a top-type spin valve sensor and a bottom-type spin valve sensor are equivalents in the field of spin valve sensor structures, both accomplishing the same function.

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Lin et al. in view of Fuke et al. to deposit the ferromagnetic layer on the IrMnN antiferromagnetic layer as taught by

Tanaka et al. since such a structure is a known equivalent to the Lin et al. structure, and substitution of known equivalents requires no express motivation in the art.

Regarding claims 11 and 12, Fuke et al. disclose overlapping concentrations and that the exact alloy compositions are cause effective variables in terms of the blocking temperature and bias magnetic field (*col. 2, lines 57 – 67; col. 5, lines 54 – 55; and Figures 3 – 9*). It would, therefore, have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the Ir, Mn and N concentrations through routine experimentation, especially given the Fuke et al. teachings.

Regarding claim 13, Fuke et al. disclose thickness values meeting applicants' claimed limitations for controlling the exchange coupling forces of the antiferromagnetic IrMnN film in MR sensors (*col. 1, lines 6 – 11 and col. 7, lines 18 – 33*). It would, therefore, have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the film thickness through routine experimentation, especially given the Fuke et al. teachings.

Regarding claim 15, Lin et al. in view of Tanaka et al. disclose a plurality of ferromagnetic layers deposited on the antiferromagnetic layer (*pinned and free layers; Tanaka et al.: Abstract; Section II; Lin et al.: Figure 13 – FL1 and FL2*).

Regarding claims 18 and 37, Tanaka et al. disclose that the antiferromagnetic layer and the ferromagnetic layers are exchange coupled in both top-type and bottom-type spin valve sensors (*Introduction section – 2nd column*).

Regarding claim 19, Tanaka et al. disclose depositing the antiferromagnetic layer on a substrate in the bottom-type spin valve sensor (*Abstract*).

Regarding claim 20, the limitation “A soft magnetic underlayer of a perpendicular magnetic recording media” is a pre-amble limitation and is not further limiting in so far as the structure of the “layered magnetic structure” is concerned. “[A] preamble is generally not accorded any patentable weight where it merely recites the purpose of a process **or the intended use of a structure**, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976)” MPEP § 2111.02 (emphasis added). Furthermore, the examiner notes that “[i]f the prior art structure is capable of performing the intended use, then it meets the claim” MPEP § 2111.02. In the instant case, the prior art structure, while disclosed for use in a spin-valve sensor would be capable of use wherever soft/antiferromagnetic layer structures were used.

11. Claims 14 and 16 rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. ('170 A1) in view of Fuke et al. ('049) and Tanaka et al., as applied above, and further in view of Saito et al. ('067).

Lin et al. ('170 A1) in view of Fuke et al. ('049) and Tanaka et al. are relied upon as described above.

Lin et al. ('170 A1) in view of Fuke et al. ('049) and Tanaka et al. fail to disclose a layered magnetic structure comprising a plurality of antiferromagnetic and ferromagnetic layers.

However, Saito et al. teach that forming a layered magnetic structure comprising a plurality of ferromagnetic and antiferromagnetic layers meeting applicant's claimed numerical limitations (i.e. "from 2 to 40" – claim 16) results in a more stable bias field (*col. 10, lines 53 – 65; col. 11, lines 7 – 12; and Figures 3 and 4*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Lin et al. ('170 A1) in view of Fuke et al. ('049) and Tanaka et al. to include a plurality of ferromagnetic and antiferromagnetic layers meeting applicant's claimed numerical limitations as taught by Saito et al. in order to make the bias field more stable.

12. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. ('170 A1) in view of Fuke et al. ('049) and Tanaka et al. as applied above, and further in view of Hikosaka et al. (U.S. Patent No. 5,942,342) and applicant's admissions.

Lin et al. ('170 A1) in view of Fuke et al. ('049) and Tanaka et al. are relied upon as described above.

Lin et al. ('170 A1) in view of Fuke et al. ('049) and Tanaka et al. fail to explicitly disclose the preamble limitation "[a] soft magnetic underlayer of a perpendicular magnetic recording media", nor whether GMR films and perpendicular films are analogous art.

However, applicant's admit that "[i]n addition to their use in GMR sensors, multi-layer magnetic films may be used in perpendicular magnetic recording media.

Conventional perpendicular recording media typically include a hard magnetic recording layer and a soft magnetic underlayer..." (*page 2, lines 20 – 22*).

In addition, Hikosaka et al. teach that soft magnetic underlayers of perpendicular recording media are known to include both antiferromagnetic layers and ferromagnetic layers (*Figures 4 and 5; col. 9, lines 23 – 36; col. 10, lines 17 – 21; and col. 10, line 61 bridging col. 11, line 3*), wherein such a structure prevents the generation of the domain walls in the soft ferromagnetic layer and a bias magnetic field is readily applied to the soft ferromagnetic layers (*col. 9, lines 30 – 36; and col. 9, line 65 bridging col. 10, line 16*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Lin et al. in view of Fuke et al. and Tanaka et al. to be used as a soft magnetic underlayer of a perpendicular magnetic recording media as taught by Hikosaka et al. and applicants, since Hikosaka et al. teach that such an intended use is known in the art to produce a structure that prevents the generation of the domain walls in the soft ferromagnetic layer and allows a bias magnetic field to be readily applied to the soft ferromagnetic layers.

Art Unit: 1773

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (703) 308-1737. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on (703) 308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0651.



KMB
March 11, 2003



Paul Thibodeau
Supervisory Patent Examiner
Technology Center 1700